# FOURTH REPORT TO THE INDIANA GENERAL ASSEMBLY

## INDIANA 21ST CENTURY RESEARCH AND TECHNOLOGY FUND
## INDIANA ECONOMIC DEVELOPMENT CORPORATION
## PERIOD: JULY 1, 2004 TO JULY 1, 2005

INDIANA

21st Century

Research & Technology Fund

# FOURTH REPORT TO THE INDIANA GENERAL ASSEMBLY

Indiana Twenty-First Century Research and Technology Fund
Indiana Economic Development Corporation
Period: July 1, 2004 to July 1, 2005

## INTRODUCTION

In its Fourth Report to the General Assembly, the Indiana 21st Century Research and Technology Fund summarizes its activities in the last fiscal year. This report includes a discussion of awards made through its SBIR/STTR Matching Program, a brief synopsis of awards based on the Fund's 'Round 6' competition, as well as information regarding the Fund's community-building and information-sharing efforts. Its narrative emphasizes the critical impact of technology-based company emergence and development on the creation of high-paying jobs in Indiana. The Appendix contains applicant and awardee information in the format prescribed by the General Assembly.

Administratively, the Indiana 21st Century Research and Technology Fund has moved into the Indiana Economic Development Corporation. The 21st Century Fund is now responsible to the Board of the Indiana Economic Development Corporation.

The SBIR/STTR Matching Program has provided $6 million dollars to approximately 60 Indiana small company recipients during the period Jan 2003 to Dec. 2004. There is a backlog of Phase I match requests awaiting action in 2005.

The 21st Century Fund's sixth round of competition resulted in 18 awards for a total of $22,418,990. The Round 6 awards were discussed in detail in the Third Report to the Indiana General Assembly. These materials will not be repeated here, although the relevant data, including applicants to Round 6, are collected in the Appendix.

## SBIR/STTR MATCHING

During the '03-'05 biennium the 21st Century Fund's Board added a new program intended to provide essential support to technology-based small businesses. The 21st Century Research and Technology Fund Board, recognizing the unique challenges inherent in the technology innovation process, particularly for emerging companies, created a program to match Indiana Phase I grants made by federal agencies as part of their Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) programs. These federal programs, managed by the Small Business Administration in the context of federal agencies and departments, provide competitively reviewed support for both proof-of-principle research and development (Phase I) and early stage product development (Phase II). The dual purpose of this 21st Century Fund matching grant program is to both increase the numbers and competitiveness of Indiana SBIR/STTR proposals, and to increase the success of Indiana companies in moving from Phase I to Phase II. In the '03-05 biennium, approximately $6 million was provided as matching awards to small businesses.

Matching Program Outline:

The 21st Century Research and Technology Fund provides awards to Indiana entities matching Phase I SBIR and/or STTR awards up to a maximum of $100,000. The 21st Century Fund's Board set aside up to $3 million/year for the program in '03-'05. Matching funds may be granted for SBIR/STTR awards received during the period beginning January 1, 2003 through the end of the State's 2004 fiscal year (June 30, 2004.) There is a limit of three matching awards per entity, and this program is contingent on the availability of funds. Matching funds from the 21st Century Fund have been provided as grants, as follows:

A.) 75% of the match upon receipt of a federal Phase I SBIR/STTR award and application to the 21st Century Fund for matching funds.

B.) 25% of the match upon submission of a Phase II grant application, based on the Phase I award

Uses of Matching Funds:

Surveys of our Phase I awardees indicate the following uses and impacts of the 21st Century fund matching awards:

- More extensive prototype testing/additional simulation runs

- Early manufacturing/product development with resulting earlier income streams
- Exploration of additional Phase I designs/approaches
- Fast-tracking of Phase II proposal
- Attendance at meetings and development of new partnerships
- Procurement of additional equipment and effort focused on Phase I
- Bridge funding for gap between Phase I and Phase II—avoiding lay-offs and technical team disruptions
- Enhanced market research
- Redirection of Phase I research
- Early start of clinical trials

All of these activities are expected to have positive impacts on the Phase I to Phase II transition rates of Indiana Phase I proposals. Since Phase I awards are of limited duration, it would be expected that the impact of the matching program would already be apparent in the transition behavior of our first set of SBIR/STTR matching awards. In 2002, the estimated Phase I to Phase II transition rate for Indiana companies is less than 28%. Based on a survey of our 2003 Phase I matching awardees (results as of 5/01/05) the transition rate from Phase I to Phase II was 46% - a dramatic increase!

These award data are very important, first because the SBIR Phase II is the beginning of serious commercialization development work; and second because Indiana has chronically underperformed in comparison with benchmark states in SBIR/STTR grant dollars per $100,000 in Gross State Product. For instance, in 2001 Indiana received about $2 vs. Ohio's $14. Increasing Phase II award levels will rapidly redress such weaknesses in federal 'return' dollar influx.

Summary of SBIR/STTR Matching Awards:

Major thrusts of SBIR/STTR awards in the medical/biomedical area involve:

- Development of new imaging/diagnostic modalities, particularly those involving use of fluorescence detection of dental disease, thermoacoustic approaches to tissue imaging, and fluorescence-based tissue imaging
- Cancer drug development, involving chelate-based and folate receptor-based tumor cell targeting, identification of protein targets based on recognition of disordered regions of protein structure, and creation of bone-marrow protective agents
- Application of tissue engineering and bioengineering approaches to: create microalgal oral vaccines, prepare tissue cells for transplantation, develop cryopreservation methodology, implement new cell sorting approaches, apply ultrasound to therapeutics, innovate new approaches to the fermentation of biological control agents, and develop new materials for orthopedic implants
- Application of expired breath analysis and other proteomics approaches to diagnostics
- Training materials for public health

Microelectromechanical (MEMS) devices are being created to detect bacterial contamination, with applications for process monitoring and control; and innovative approaches to the characterization of nanostructured materials are being explored. Advanced technology and its applications is supported primarily through DOD, NSF, and NASA SBIR/STTR awards, including such areas as: advanced wireless, mixed reality systems, rocket and turbine propulsion systems, aerospace system design and construction approaches, applications of information technology to advanced manufacturing, analytical techniques supporting process optimization, and power system management. In addition, homeland security awards by DOD and NIH support advanced detection and response systems, as well as automated software attack prevention. DOD and NIH support significant new instruments for advanced approaches to neutron and x-ray structure determination. Finally, USDA supports applied and basic research in the areas of sustainable mushroom agriculture and microalgal-based oral vaccine development.

Some of these awards are highlighted in more detail in a later section of this report.

## COMMERCIALIZATION IMPACTS

The Fund's role in economic development has evolved in parallel with its impacts on the creation and dissemination of technology itself. By providing a multi-institutional and multi-sectorial vision of science and technology development, and its importance to society, the Fund has induced important changes in the Indiana's technology-related institutions. Here we outline some of the outcomes of such fundamental underlying change.

Fund influences include its role in:

- Technology Validation
- Pre-seed and seed funding of new and developing technology-based companies
- The evolution of large commercial enterprises (and their supplier chains)
- Attracting federal and private research and development funds
- Creating and developing large-scale intellectual capacity
- Creating broadly applied commercial sector capabilities
- Supporting innovation in both academic and commercial clusters
- Creation of unique capabilities or products
- Technology transfer/creation of new companies
- Creation of critical infrastructure/providing access to tools
- Providing a vehicle applying technology to public sector needs

## PARTNERSHIPS

Commercialization of technologies developed in academic laboratories in 21st Century Fund awards has been managed through three basic processes:

(1) Commercialization through an existing or newly created small company (7%)
(2) Commercialization through a large company (20%)
(3) Commercialization through a yet to be identified company (15%)

As a result of 21st Century Fund awards, at least 23 new companies have been formed during the last five years, of which 5 already have product sales.

It is clear that in Indiana a handful of larger companies provide the basis for commercialization of a great deal of new academic sector technology. This is an essential aspect of these companies' innovation/product development cycles. In aiding this technology commercialization, these companies provide 64% of total project costs (compared with 21% provided by the 21st Century Fund.) These companies include: Zimmer, Thomson, Lilly, Dow-Agro, Rolls-Royce, Honeywell, Caterpillar, Ispat Inland Steel, Reilly Industries, Delphi, ITT, Cummins, Praxair, and Raytheon.

## FOUNDATIONAL ACTIVITIES

An important class of award, those creating essential science, technology, or business infrastructure, provide new tools, facilities, or expertise of importance to broad academic or commercial sector communities. These awards have been made primarily to the academic sector. In many cases projects are intended to form the basis for future commercial development. 22% of 21st Century Fund awards have been of this type. Of the total project costs, the 21st Century Fund contributes only 12%. The majority of project costs (62%) are provided by federal and other sources of follow-on funding.

The Indiana General Assembly has indicated the importance it attributes to increasing the awareness of the Indiana science and technology community of opportunities to acquire technology development and commercialization funding support through federal agencies. The 21st Century Fund now provides to an e-mailing list of about 600 recipients information about federal science/technology policies and specific funding opportunities. The 21st Century Fund also forwards funding opportunities 'lists', such as that developed by the State Science and Technology Institute (SSTI) to this mailing list.

The 21st Century Fund participates in other 'community building' activities, including sponsoring science/technology meetings in the State, and by developing 'Luncheons' where specific areas of technology commercialization are addressed. Summaries of more recent luncheons are available at the 21st Century Fund website.

## APPENDIX MATERIALS

- List of 21st Century Fund awards from the Round 6 competition and from the second year (04-05) of SBIR/STTR matching.
- List of 21st Century Fund Round 6 Applicants
- List of 21st Century Fund (03-04) SBIR/STTR Matching Awards

**FUNDED AWARDS FOR FY 04/05**

| Round # | Award # | Principle Investigator | Grantee Name | City | State | ZIP | County | Award Amount |
|---|---|---|---|---|---|---|---|---|
| 6 | 427040723 | Herb Schwartz | Schwartz Biomedical, LLC | Fort Wayne | IN | 46808 | Allen | $ 1,273,778.00 |
| 6 | 511040815 | Neal Baitcher | Industrial Composites, Inc. | Fort Wayne | IN | 46818 | Allen | $ 759,250.00 |
| 6 | 512040819 | Tim Bruemmer | Nexaura Systems, LLC | Carmel | IN | 46032 | Hamilton | $ 444,887.00 |
| 6 | 506040768 | Susanne Ragg | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 1,994,091.00 |
| 6 | 510040784 | Clement J. McDonald | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 1,905,100.00 |
| 6 | 510040797 | John Campbell | Prosolia, Inc. | Indianapolis | IN | 46202 | Marion | $ 1,773,347.00 |
| 6 | 428040728 | Richard Wagner | Phycotransgenics, L.L.C. | Bloomington | IN | 47401 | Monroe | $ 1,818,885.00 |
| 6 | 511040812 | Milos Novotny | Indiana University | Bloomington | IN | 47408 | Monroe | $ 1,994,338.00 |
| 6 | 425040717 | Alexander Mukasyan | Univ. Notre Dame, South Bend | Notre Dame | IN | 46556 | St. Joseph | $ 337,908.00 |
| 6 | 510040790 | Jeanne Romero-Severson | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ 2,000,000.00 |
| 6 | 512040817 | Jeffrey Talley | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ 1,000,000.00 |
| 6 | 502040736 | William Chappell | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ 1,666,249.00 |
| 6 | 503040742 | Michael Capano | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ 1,097,873.00 |
| 6 | 504040747 | Yulian Kin | Purdue University Calumet | West Lafayette | IN | 47907 | Tippecanoe | $ 692,199.00 |
| 6 | 507040770 | Marc Caffee | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ 382,700.00 |
| 6 | 507040774 | Jayathi Murthy | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ 429,456.00 |
| 6 | 511040805 | Christopher Leamon | Endocyte, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ 1,950,000.00 |
| 6 | 513040829 | Thomas Siegmund | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ 898,959.00 |
| SBIR 2 | 61 | Patrick M. Kelecy | Magnetic Power Motion, LLC | Floyds Knobs | IN | 47119 | Floyd | $ 69,998.00 |
| SBIR 2 | 49 | Robert C. McCarthy | VitaCyte, LLC | Carmel | IN | 46033 | Hamilton | $ 100,000.00 |
| SBIR 2 | 54 | Ivan Nesch | Nesch, LLC | Crown Point | IN | 46307 | Lake | $ 100,000.00 |
| SBIR 2 | 60 | Ivan Nesch | Nesch, LLC | Crown Point | IN | 46307 | Lake | $ 100,000.00 |
| SBIR 2 | 57 | Pete Bitar | Xtreme ADS | Anderson | IN | 46012 | Madison | $ 99,989.00 |

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|---|---|---|---|---|---|---|---|---|---|
| SBIR 2 | 43 | Tamer Wasfy | Advanced Science and Automation | Indianapolis | IN | 46234 | Marion | $ | 100,000.00 |
| SBIR 2 | 46 | Kenneth R. Dunipace | Therametric Technologies, Inc. | Indianapolis | IN | 46202 | Marion | $ | 100,000.00 |
| SBIR 2 | 47 | T. Dan Bailey | Trexco, LLC | Indianapolis | IN | 46204 | Marion | $ | 99,935.00 |
| SBIR 2 | 50 | Michael H. Phillips | Piezotech, LLC | Indianapolis | IN | 46256 | Marion | $ | 100,000.00 |
| SBIR 2 | 58 | Michael D. Root | Gabriel Interactive, Inc. | Indianapolis | IN | 46202 | Marion | $ | 100,000.00 |
| SBIR 2 | 63 | Tamer Wasfy | Advanced Science and Automation Corp. | Indianapolis | IN | 46254 | Marion | $ | 100,000.00 |
| SBIR 2 | 34 | Erik J. Woods | General BioTechnology, LLC | Indianapolis | IN | 46202 | Marion | $ | 100,000.00 |
| SBIR 2 | 51 | Richard E. Wagner | Phycotransgenics, LLC | Bloomington | IN | 47401 | Monroe | $ | 75,000.00 |
| SBIR 2 | 52 | Richard E. Wagner | Phycotransgenics, LLC | Bloomington | IN | 47401 | Monroe | $ | 100,000.00 |
| SBIR 2 | 48 | Sasha Klyachko | PartTec, LLC | Bloomington | IN | 47407 | Monroe | $ | 99,246.55 |
| SBIR 2 | 59 | Alfred Strickholm | Indiana Labs, LLC | Bloomington | IN | 47408 | Monroe | $ | 100,000.00 |
| SBIR 2 | 33 | Sonney E. Kirkley | Information In Place, Inc. | Bloomington | IN | 47404 | Monroe | $ | 100,000.00 |
| SBIR 2 | 35 | Gary L. Broxton | Radiation Effects Research Associates, Inc. | Bloomington | IN | 47401 | Monroe | $ | 93,707.00 |
| SBIR 2 | 36 | Richard Goldsworthy | The Academic Edge, Inc. | Bloomington | IN | 47403 | Monroe | $ | 100,000.00 |
| SBIR 2 | 37 | Richard Goldsworthy | The Academic Edge, Inc. | Bloomington | IN | 47403 | Monroe | $ | 99,998.00 |
| SBIR 2 | 38 | Richard Goldsworthy | The Academic Edge, Inc. | Bloomington | IN | 47403 | Monroe | $ | 100,000.00 |
| SBIR 2 | 64 | Barton Bennett | Odyssian Technology, LLC | Mishawaka | IN | 46545 | St. Joseph | $ | 99,947.00 |
| SBIR 2 | 53 | James J. Mason | Granger Engineering, LLC | Granger | IN | 46530 | St. Joseph | $ | 99,988.00 |
| SBIR 2 | 55 | James S. Lehnert | River Valley Wireless, LLC | West Lafayette | IN | 47906 | Tippecanoe | $ | 100,000.00 |
| SBIR 2 | 56 | Paul Arlton | Lite Machines Corporation | West Lafayette | IN | 47906 | Tippecanoe | $ | 100,000.00 |
| SBIR 2 | 41 | Charles E. Lucas | PC Krause and Associates, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ | 100,000.00 |
| SBIR 2 | 42 | Jacob L. Smelser | Omega Wireless Solutions, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ | 99,880.00 |
| SBIR 2 | 44 | Benjamin Austin | IN Space, LLC | West Lafayette | IN | 47906 | Tippecanoe | $ | 86,488.79 |
| SBIR 2 | 62 | Daniel J. Schlitz | Thorrn Micro Technologies, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ | 100,000.00 |
| SBIR 2 | 39 | George T. Tsao | General Resource Technology, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ | 80,000.00 |
| SBIR 2 | 40 | Eric Walters | PC Krause and Associates, Inc. | West Lafayette | IN | 47906 | Tippecanoe | $ | 99,661.00 |

| | | | APPLICATIONS NOT FUNDED | | | | | AMOUNT REQUESTED |
|---|---|---|---|---|---|---|---|---|
| 6 | 427040724 | Herb Schwartz | Schwartz Biomedical, LLC | Fort Wayne | IN | 46805 | Allen | $ 1,447,114.00 |
| 6 | 510040798 | Keith Bultemeier | Phelps Dodge Magnet Wire | Fort Wayne | IN | 46803 | Allen | $ 1,943,255.00 |
| 6 | 514040848 | Kevin Carlstrom | International Truck & Engine Co. | Fort Wayne | IN | 46803 | Allen | $ 1,390,500.00 |
| 6 | 514040849 | Larry Zepp | Dura-Trac Motors, Inc. | Fort Wayne | IN | 46809 | Allen | $ 1,431,900.00 |
| 6 | 506040767 | Robert Shoemaker | Physics, Energy & Health | Otterbein | IN | 47970 | Benton | $ 511,756.00 |
| 6 | 422040712 | Gregory Stutz | Hartford Concrete Products, Inc. | Hartford City | IN | 47348 | Blackford | $ 1,973,269.00 |
| 6 | 505040757 | Benjamin Close | MedTG, LLC | Brazil | IN | 47834 | Clay | $ 726,862.00 |
| 6 | 514040843 | Wayne Zage | Ball State University | Muncie | IN | 47306 | Delaware | $ 909,347.00 |
| 6 | 514040845 | Keith Smith | The AST Group | Muncie | IN | 47304 | Delaware | $ 1,295,000.00 |
| 6 | 505040754 | Paul Todd | Space Hardware Optimization Technology | Greenville | IN | 47124 | Floyd | $ 1,213,984.00 |
| 6 | 515040853 | Stephen Gootee | Science Applications Intl. Corp. - SAIC | Bloomfield | IN | 47424 | Greene | $ 2,000,000.00 |
| 6 | 515040854 | Khosrow Nematollahi | The Global University | Carmel | IN | 46204 | Hamilton | $ 580,000.00 |
| 6 | 517040857 | Elaine Habig | Isprit LLC | Carmel | IN | 46204 | Hamilton | $ 650,000.00 |
| 6 | 512040816 | Robert Uleski | JATECH Scientific Inc. | Knightstown | IN | 46148 | Henry | $ 1,634,158.00 |
| 6 | 514040840 | Jan Hendrix | KHDC/KTC | Kokomo | IN | 46902 | Howard | $ 1,775,000.00 |
| 6 | 515040855 | Keith Baldwin | WIS Medical | Kokomo | IN | 46904 | Howard | $ 251,500.00 |
| 6 | 505040755 | Philip Griffity | GFT, LLC | Pennville | IN | 47369 | Jay | $ 535,836.00 |
| 6 | 504040749 | Robert Kramer | Purdue University Calumet | Hammond | IN | 46323 | Lake | $ 1,987,009.00 |
| 6 | 513040824 | Eugene Smotkin | NuVant Systems Inc. | Crown Point | IN | 46307 | Lake | $ 1,000,000.00 |
| 6 | 420040708 | Kenenth U. Lau | JKL Software Development, LLC | Pendleton | IN | 46064 | Madison | $ 786,000.00 |
| 6 | 510040783 | Pete Bitar | Xtreme Alternative Defense Systems | Anderson | IN | 46013 | Madison | $ 3,402,000.00 |
| 6 | 414040703 | Keith L. March | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 2,050,000.00 |
| 6 | 420040710 | Mark Sothmann | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 2,000,000.00 |
| 6 | 423040715 | Charles Clark | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 5,000,000.00 |
| 6 | 427040722 | Rose Fife | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ 1,501,447.00 |

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|---|---|---|---|---|---|---|---|---|---|
| 6 | 430040733 | Kenneth Pesyna | Rolls-Royce Corporation | Indianapolis | IN | 46206 | Marion | $ | 2,000,000.00 |
| 6 | 503040737 | Brian Herhusky | Persona Systems | Indianapolis | IN | 46226 | Marion | $ | 1,724,800.00 |
| 6 | 503040741 | Ariel Fernandez | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 2,000,000.00 |
| 6 | 504040746 | Charles Mihaliak | Dow AgroSciences LLC | Indianapolis | IN | 46268 | Marion | $ | 1,830,400.00 |
| 6 | 505040756 | Julie Meek | The Haelan Group | Indianapolis | IN | 46202 | Marion | $ | 770,816.00 |
| 6 | 505040758 | Martin Harmless | Clarion Sensing Systems | Indianapolis | IN | 46222 | Marion | $ | 1,085,974.00 |
| 6 | 505040759 | Jeffrey Smith | Crowe Chizek and Company LLC | Indianapolis | IN | 46240 | Marion | $ | 975,000.00 |
| 6 | 506040761 | Michael Mathur | BL Healthcare, Inc. | Indianapolis | IN | 46240 | Marion | $ | 1,168,461.00 |
| 6 | 506040762 | Robert Meek | Theron, Inc. | Indianapolis | IN | 46290 | Marion | $ | 1,951,086.00 |
| 6 | 506040764 | Akin Ecer | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 1,999,676.00 |
| 6 | 509040778 | Joseph Garlich | Semafore Pharmaceuticals | Indianapolis | IN | 46268 | Marion | $ | 1,992,863.00 |
| 6 | 510040781 | T. Dan Bailey | Trexco LLC | Indianapolis | IN | 46204 | Marion | $ | 960,785.00 |
| 6 | 510040785 | Janet Hock | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 1,925,673.00 |
| 6 | 510040789 | Christoph Naumann | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 917,184.00 |
| 6 | 510040793 | David Bodenhamer | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 1,999,297.00 |
| 6 | 510040796 | James R (Rick) Ludwig | Indiana Center for Applied Protein Sciences | Indianapolis | IN | 46202 | Marion | $ | 2,000,000.00 |
| 6 | 511040801 | Mahesh Merchant | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 220,000.00 |
| 6 | 511040807 | John Hurrell | Inproteo | Indianapolis | IN | 46202 | Marion | $ | 1,950,000.00 |
| 6 | 511040808 | Gary D Hutchins | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 4,900,298.00 |
| 6 | 511040813 | Raymond DeGrella | Tienta Sciences, Inc. | Indianapolis | IN | 46202 | Marion | $ | 1,398,000.00 |
| 6 | 511040814 | Jie Chen | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 319,152.00 |
| 6 | 512040820 | Ali Jafari | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 497,879.00 |
| 6 | 513040823 | Mark Pescovitz | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 2,000,000.00 |
| 6 | 513040827 | Tom Buersmeyer | Indiana Organ Procurement Organization | Indianapolis | IN | 46204 | Marion | $ | 1,958,390.00 |
| 6 | 513040828 | Bruce Molitoris | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 1,062,381.00 |
| 6 | 513040832 | Hazim El-Mounayri | IUPUI at Indianapolis | Indianapolis | IN | 46202 | Marion | $ | 781,869.00 |
| 6 | 513040833 | Russell Eberhart | Computelligence LLC | Indianapolis | IN | 46202 | Marion | $ | 487,000.00 |

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|---|---|---|---|---|---|---|---|---|---|
| 6 | 513040835 | De Liufu | Piezo Technologies | Indianapolis | IN | 46268 | Marion | $ | 1,017,477.00 |
| 6 | 514040842 | Charles Mihaliak | Dow AgroSciences | Indianapolis | IN | 46268 | Marion | $ | 1,992,300.00 |
| 6 | 514040846 | David E. Clemmer | Indiana University-Bloomington | Indianapolis | IN | 47403 | Marion | $ | 729,875.00 |
| 6 | 514040847 | David Kreimer | Tienta Sciences, Inc. | Indianapolis | IN | 46202 | Marion | $ | 1,995,652.00 |
| 6 | 515040852 | Emanuel Papandreas | Candent Technologies, Inc. | Indianapolis | IN | 46236 | Marion | $ | 724,939.19 |
| 6 | 423040716 | Sonny Kirkley | Information in Place, Inc. | Bloomington | IN | 47404 | Monroe | $ | 2,000,000.00 |
| 6 | 430040734 | Steven Wallace | Indiana University-Bloomington | Bloomington | IN | 47403 | Monroe | $ | 547,686.00 |
| 6 | 504040750 | Peter Ortoleva | Indiana University-Bloomington | Bloomington | IN | 47403 | Monroe | $ | 880,481.00 |
| 6 | 506040763 | Andrew Lumsdaine | Indiana University-Bloomington | Bloomington | IN | 47403 | Monroe | $ | 881,611.00 |
| 6 | 511040802 | James Glazier | Indiana University-Bloomington | Bloomington | IN | 47403 | Monroe | $ | 2,401,911.00 |
| 6 | 427040721 | Timothy Ovaert | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ | 5,000,000.00 |
| 6 | 429040732 | Thomas Fuja | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ | 1,415,106.00 |
| 6 | 505040760 | Steve Emo | Honeywell | South Bend | IN | 46628 | St. Joseph | $ | 1,980,000.00 |
| 6 | 507040771 | Matthias Scheutz | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ | 974,361.00 |
| 6 | 511040809 | Steven Schmid | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ | 1,491,051.00 |
| 6 | 512040821 | David Leighton | University of Notre Dame | Notre Dame | IN | 46556 | St. Joseph | $ | 1,066,294.00 |
| 6 | 420040709 | James Dammon | Fairfield Mfg. Co, Inc | Lafayette | IN | 47903 | Tippecanoe | $ | 650,000.00 |
| 6 | 422040713 | James McGlothlin | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,989,689.00 |
| 6 | 423040714 | Rodney Trice | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 426040719 | Yan Chen | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 428040727 | Farshid Sadeghi | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,423,961.00 |
| 6 | 429040730 | David Yau | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 501,731.00 |
| 6 | 501040735 | Yeong E. Kim | 2K Corporation | Lafayette | IN | 47904 | Tippecanoe | $ | 1,940,000.00 |
| 6 | 503040739 | Michael Hiles | Cook Biotech Incorporated | West Lafayette | IN | 47906 | Tippecanoe | $ | 1,775,000.00 |
| 6 | 503040743 | Richard Schwartz | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,999,986.00 |
| 6 | 503040744 | Herbert Moskowitz | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 729,849.00 |
| 6 | 503040745 | Ahmed Elmagarmid | Purdue University | West lafayette | IN | 47907 | Tippecanoe | $ | 1,791,480.00 |

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|---|---|---|---|---|---|---|---|---|---|
| 6 | 504040748 | Anastasios Lyrintzis | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 952,031.00 |
| 6 | 504040751 | Reha Uzsoy | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,856,364.00 |
| 6 | 505040753 | Srinivasan Chandrasekar | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,975,691.00 |
| 6 | 506040765 | Karthik Ramani | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,285,505.00 |
| 6 | 506040766 | Nainesh Rathod | Imaginestics, LLC | West Lafayette | IN | 47906 | Tippecanoe | $ | 1,690,205.00 |
| 6 | 507040769 | Dor Ben-Amotz | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,960,433.00 |
| 6 | 507040773 | Paul Krause | P.C. Krause & Associates | West Lafayette | IN | 47906 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 507040775 | Zygmunt Pizlo | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 729,222.00 |
| 6 | 509040777 | Bruce Hamaker | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,728,929.00 |
| 6 | 510040782 | Linda Wang | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,786,377.00 |
| 6 | 510040786 | Ronnie Wilbur | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,883,041.00 |
| 6 | 511040799 | Stephen Heister | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 511040800 | Joe Pekny | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 511040811 | Osvaldo Campanella | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,661,717.00 |
| 6 | 512040822 | James Braun | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 2,000,000.00 |
| 6 | 513040825 | Jongmook Lim | En'Urga Inc | West Lafayette | IN | 47906 | Tippecanoe | $ | 487,100.00 |
| 6 | 513040826 | Peter Meckl | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 445,200.00 |
| 6 | 513040831 | Richard Stroshine | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 338,323.00 |
| 6 | 513040836 | Timothy Fisher | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,926,243.00 |
| 6 | 514040838 | Nagabhushana Prabhu | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 1,371,190.00 |
| 6 | 514040844 | C. Richard Liu | Purdue University | West Lafayette | IN | 47907 | Tippecanoe | $ | 515,738.00 |
| 6 | 515040856 | Nick Turner | Zeeko Technologies LLC | West Lafayette | IN | 47906 | Tippecanoe | $ | 1,604,000.00 |
| 6 | 426040718 | Mike Ciholas | CIHOLAS Enterprises | Evansville | IN | 47713 | Vanderburgh | $ | 1,965,303.00 |
| 6 | 510040795 | Rex Stith | IUPUI | Evansville | IN | 47712 | Vanderburgh | $ | 1,936,536.00 |
| 6 | 512040818 | Dhansukh Chevli | Uniseal, Inc. | Evansville | IN | 47710 | Vanderburgh | $ | 1,713,904.00 |
| 6 | 507040772 | W. Tad Foster | Indiana State University | Terre Haute | IN | 47809 | Vigo | $ | 870,275.08 |
| 6 | 507040776 | Richard Stamper | Stamper Medical Technologies | Terre Haute | IN | 47803 | Vigo | $ | 296,000.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 511040810 | Azad Siahmakoun | MEMS & Microfabrication Group | Terre Haute | IN | 47803 | Vigo | $ | 716,618.00 |
| 6 | 513040837 | Christopher Hebb | Home Data Source | Terre Haute | IN | 47803 | Vigo | $ | 1,461,483.00 |
| 6 | 503040738 | Laila Razouk | BioVitesse | Sunnyvale | CA | 94087 | Santa Clara | $ | 1,949,000.00 |

# YOUR CELL, OR MINE?

## SHOT, INC.

**Greenville, Floyd County**

**There are a lot of reasons to isolate specific cells from a mixture. In particular, the properties of individual cells are difficult to determine if the sample is contaminated with other cell types. However, really pure cell preparations are very difficult to obtain, and maintain. It has also been found that use of bone marrow transplants to 'rescue' cancer chemotherapy recipients has greater efficacy if the cells are appropriately purified. Thus, cell separation has very practical importance.**


**SHOT, in collaboration with Ohio State University and the Cleveland Clinic Foundation, is developing a commercial flowing cell separation device based on the application of an intense, shaped, magnetic field. This approach yields high purity cell separations with no loss of cell viability.**

**SHOT is an engineering services and product development firm in Floyd county, in southern Indiana. While SHOT has had a close relationship with NASA's space flight programs, it has pursued terrestrial applications of its innovations as well. Thus, the SBIR Phase I project which will refine the magnetic separation technology, is supported by both the National Institutes of Health and National Science Foundation, both of which were matched by the Indiana 21st Century Fund.**

**Clearly projects such as those underway at SHOT will bring essential engineering expertise to the solution of critically important biological and biomedical problems.**

***For more information, visit SHOT's website: http://www.shot.com/.***

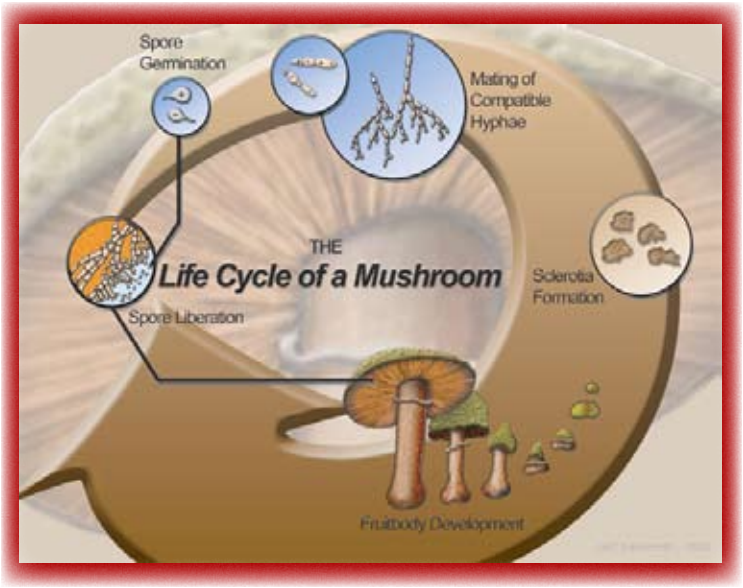
# KEEPING PLEUROTUS & LETINUS IN THE DARK

## HAWTHORNE MUSHROOM FARMS, INC.

**Montgomery, Daviess County**

**The 14 person staff of Hawthorne Mushroom Farms, Inc., located in Daviess County, produces more than 10 TONS of shiitake and oyster mushrooms each month! This requires application of advanced cultivation techniques, since you won't find such quantities (or quality) by wandering around in the woods.**

**Mushroom use is increasing rapidly for both home and restaurant uses. Shiitake mushrooms taste good, and ancient Chinese physicians prescribed it for its life-enhancing properties and even as therapy for illnesses such as flu and liver disease! They are also good sources of folate, potassium, and selenium.**




**Yet this valuable 'crop' is underdeveloped in the US, and Indiana in particular; and while nearly 90% of the world's mushroom supply comes from China (in 1997, 5 million tons of edible mushrooms were produced), there is no logical reason why we cannot provide our own needs for this valuable commodity (fresh shiitake mushrooms sell for $4-6.50/lb wholesale.)**

**However, mushrooms under cultivation are very susceptible to contamination, and sustaining high quality is a considerable challenge. Hawthorne's SBIR activities focus on developing large-scale mushroom cultivation techniques that will lead to reproducible products and which can be adopted easily by the Indiana agricultural community.**

# SEEING THROUGH THE EYES OF TOMORROW!

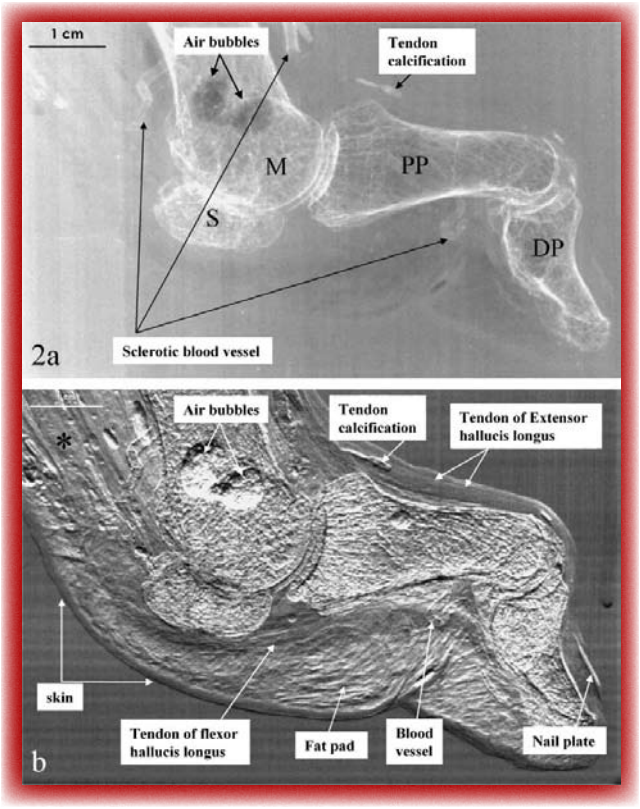
## NESCH, LLC.

**Crown Point, Lake County**

**Though physicians in the United States are among the best in the world, they are limited by the diagnostic tools currently available. One shortcoming of modern medicine is the inadequate ability to image soft tissue such as cartilage or tumors. This makes early diagnosis of diseases affecting soft tissue, such as breast cancer or rheumatoid arthritis, exceedingly difficult. However, using Diffraction-Enhanced Imaging (DEI) instrumentation, Nesch, LLC is paving the way toward more accurate and comprehensive diagnostic imaging tools.**

**DEI is an x-ray imaging technique in which very tiny deflections of light in an x-ray beam can be detected through the use of crystal optics. These deflections occur when the beam goes through materials of different densities such as a tumor in healthy tissue. Thus, DEI provides means for soft-tissue x-ray imaging, which has always been a significant problem for conventional radiography. In addition, DEI provides greater contrast at lower delivered x-ray doses than conventional radiography. The technique holds great promise for medical imaging, but this will be realized only if instruments are developed that do not rely on the presence of a multibillion-dollar accelerator, such as the Advanced Photon Source at Argonne National Laboratory.**

**Through the SBIR program, Nesch, LLC is working to develop instrumentation that will bring this technology out of the lab and into the hands of physicians. This could greatly improve the diagnostic capabilities in hospitals and revolutionize mammography as well as the field of orthopedics.**




Caption: *Figure 2a: Conventional synchrotron radiograph of the great toe showing osteoporotic changes as well as sclerotic vessels. Figure 2b: Diffraction-Enhanced image of the same specimen. Considerably more soft tissue structures are identifiable in this image, including the major tendons of the toe and the fat pad under the ball of the foot.*

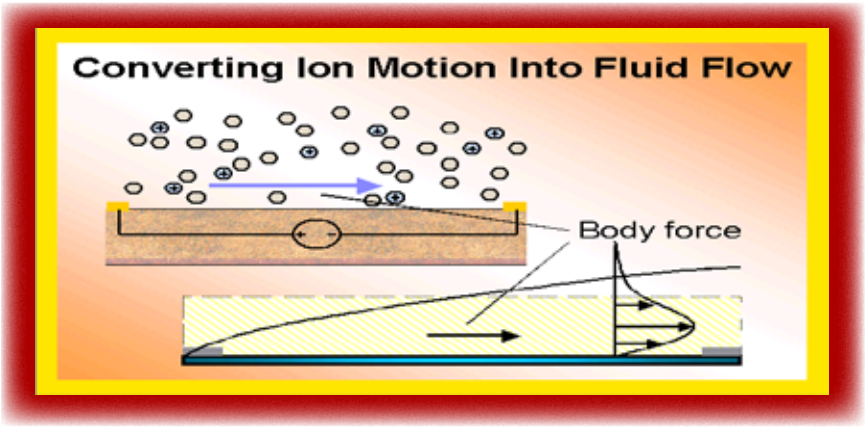
# THE LONG AND SHORT OF COOLING

## THORRN MICRO TECHNOLOGIES, INC.

**West Lafayette, Tippecanoe County**

**The improvements in electronic device capabilities that provide us with extraordinary computing power, are the result of the semiconductor industry's continuous reduction of circuit feature size. But, as circuits become increasingly dense, a new limiting factor has become evident—heat. In fact, today's PC chips can dissipate more than 100 watts of power.**

**Particularly for small portable electronics, including laptop computers, conventional air-cooled heat sinking devices cannot accommodate such high heat transfer rates, and**




**for every 10° rise of junction temperature circuit failure rate doubles, making cooling a primary issue in contemporary integrated circuit design.**

**This SBIR Phase I project, supported by the National Science Foundation, with matching funds from the 21st Century Fund, will develop high-efficiency microscale heat exchangers, based on ion-driven air flow, a process which takes advantage of the motion of electrical charges induced by the presence of a magnetic field.**

**From this work we can expect to see the efficiency of macroscopic heat dissipation dramatically increased by turning to the use of microscale cooling structures coupled with highly advanced air motion control technology.**

# STUNNING INSIGHTS INTO HOMELAND SECURITY

## XTREME ALTERNATIVE DEFENSE SYSTEMS, LTD.

**Anderson, Madison County**

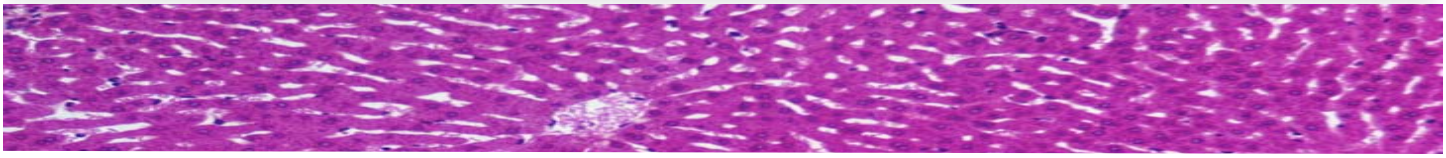
**A stun-gun-like device that directs electrical energy to a target up to 100 feet away to temporarily disable; a perimeter defense system that can detonate or neutralize incoming rocket propelled grenades (RPGs) – both sound like something out of a science fiction movie? These high-tech gadgets aren't mere fabrications of Hollywood; rather, they are part the StunStrike series of non-lethal directed energy weapons (NLDEW) and prototypes that are actually being developed by Pete Bitar and his staff in Anderson, Indiana.**

**Pete is the President and Chief Developer at Xtreme Alternative Defense Systems Ltd. (XADS). XADS is an innovative R&D company in Madison County that makes a series of weapons designed to deter or temporarily immobilize an aggressor without causing permanent physical harm. Through multiple SBIR awards from the Department of Defense, XADS is developing a portable battery-powered StunStrike prototype, as well as a larger vehicle-mounted unit, both of which could be useful for non-lethal area denial, vehicle disabling, hostage and rescue operations, and other security applications.**

**Along with StunStrike, XADS is developing a number of other NDLEW tools including the Photonic Disruptor, Green (PD/G) dazzling laser series. The PD/G is devised to assess, deter, and/or preclude a threat without any lasting effects and it has already been deployed in Operation Enduring Freedom.**

*For more information, visit the XADS website: http://www.XtremeADS.com/.*

# A TISSUE OF TRUTHS!

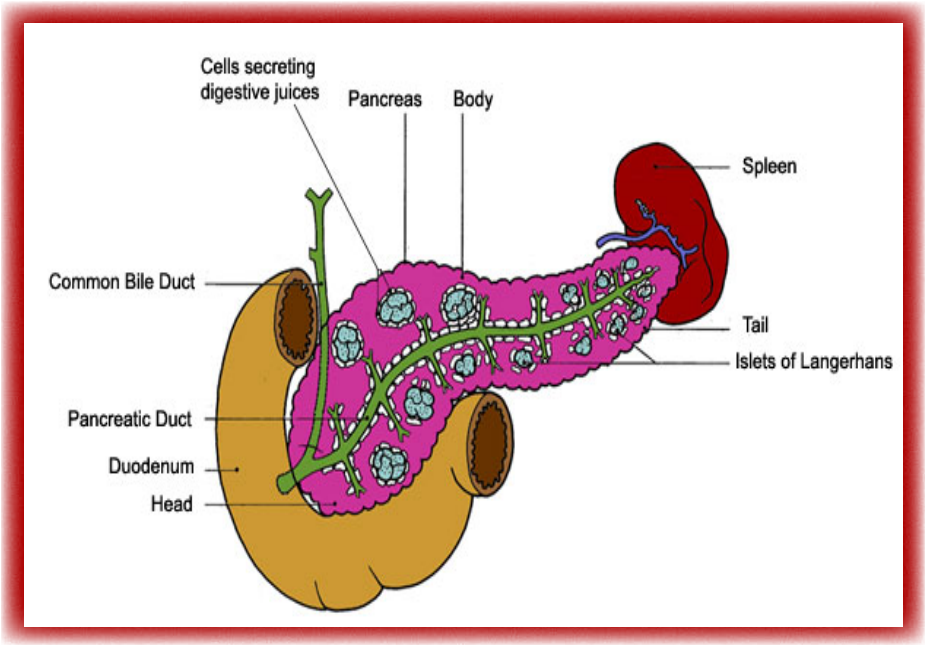


## VITACYTE, LLC.

**Carmel, Hamilton County**

**While the individual cell is the basic unit of life, our cells typically function within complex multi-cellular structures called tissues. Tissues include muscle, liver, brain, etc.**

**One vitally important tissue is the pancreas. Among its component cells are 'islet cells', which function to sense blood sugar levels and release the hormone, insulin, into the blood stream to maintain optimal sugar levels.**




**Maintenance of appropriate equilibrium levels of blood sugars is essential for sustained good health. Diseases, such as diabetes, lead to disruptions of normal processes maintaining these levels, with dire consequences.**

**One therapeutic approach to diabetes involves repopulating the pancreas with viable islet cells. However, infusion of islet cells requires first their isolation from the donor's pancreatic tissue matrix.**

**With SBIR funding from the National Institutes of Health, and matching funds from the 21st Century Fund, VitaCyte, LLC is developing high efficiency methods to dissociate functional islet cells from other components of the tissue matrix. This effort involves optimizing a range of physical and enzymatic processes. In addition to their role in medical therapy, access to pancreatic and liver cells will also allow biomedical researchers to better understand the physiological processes in which these cells participate.**

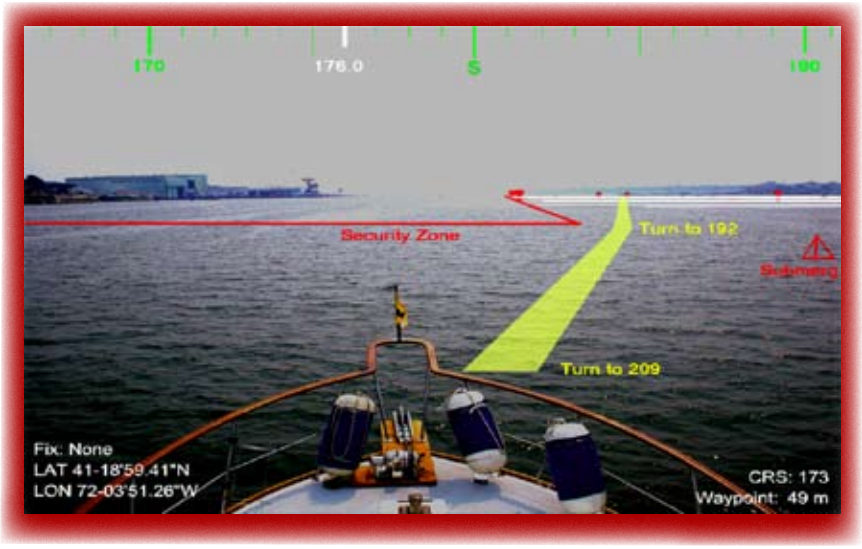
# SEEING IS DOING!

# INFORMATION IN PLACE, INC.

**Bloomington, Monroe County**

**Instead of simply seeing a problem, Information in Place, Inc (IIPI), intends that you will simultaneously 'see' the solution, through application of augmented and mixed-reality technologies. For example, the future of U.S. defense forces will not rely solely on advanced weaponry and breakthrough communications technologies, but will equally depend on the use of state-of-the-art techniques for training soldiers to use cutting-edge equipment and to react quickly and effectively in combat, through use of augmented reality training tools of the future. Augmented reality is a method of superimposing graphics, sounds and other sensory attributes onto the real world in real-time. Through the use of special "goggles," users can, for example, 'see' how to repair a rifle, or see a simulated helicopter flying between actual buildings! Even a novice can carry out complex and unfamiliar tasks with an augmented reality 'engine' serving as a guide and mentor.**

**Through the federal DOD SBIR program, and matching funds from the 21st Century Fund, IIPI is creating training systems for the U.S. Army's Objective Force Warrior (OFW) program – the Army's chief science and technology effort. Tools created by IIPI allow OFW soldiers to perform training exercises with simulated explosions and enemy forces, in a real-world environment, using the actual equipment they would use in combat.**




**Other applications for IIPI's augmented reality tools are data management and visualization for air traffic control for both Air Force and civilian use (another project with matching funds from the 21st Century Fund); navigational aids for the Coast guard resembling "a virtual highway and road signs on the water"; tools for assisting in repair, maintenance and assembly of equipment; and even a tool to enhance a museum or zoo outing by personalizing information about an exhibit to visitors, particularly those with limited hearing, vision and mobility.**